

# CITY OF LIVINGSTON

# Water Reclamation Facility Upgrade

## Funding

February 20<sup>th</sup>, 2019



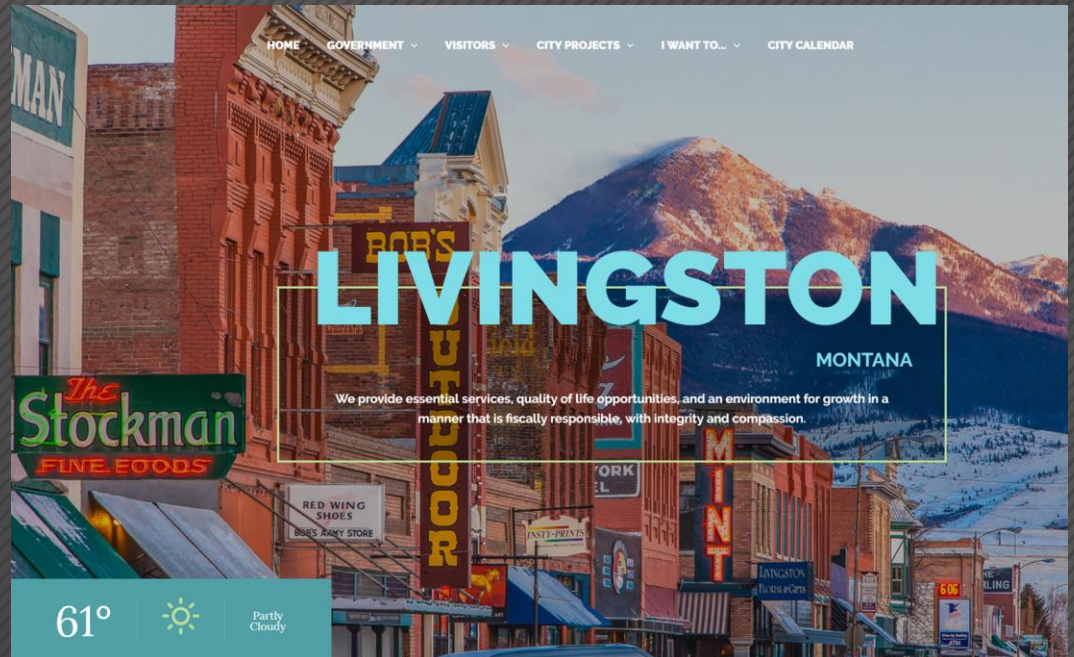
*Rural Water*  
2019 INFRASTRUCTURE FUNDING  
WORKSHOP

# LWRF Upgrade – The Prequel



## Goals/Agenda

- Overview of Plant and Project Site
- Project Development
- Challenges
- Design
- Construction











Old Clyde Park Rd

89

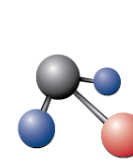




Old Clyde Park Rd



# ENVIRONMENTAL ASSESSMENT



**AES**  
2



## Floodplain Map









**Legend**

Boundary of Free Product Plume From a Sheen and Thicker

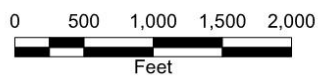
Limit of Detected Tetrachloroethene (PCE) Dissolved in Groundwater

Note:  
This map is for display purposes only and should not be considered an authoritative source.  
Aerial Imagery: 2011 NAIP



# Petroleum Free-Product Plume and Dissolved Tetrachloroethene (PCE) Plume 2014

Burlington Northern Shop Complex Facility  
Livingston, Montana





# LWRF Upgrade – The Prequel



## Existing Treatment Plant

- Coarse Screens
- Eutek HeadCell Grit Removal
- Primary Sedimentation
- Rotating Biological Contactors
- Secondary Clarifiers
- UV Disinfection





# LWRF Upgrade – The Prequel



## Project Motivators

- Old, overloaded, failing RBCs
- RBCs...
- Excessive biomass and beggiatoa breaking rotors
- Encroaching Ammonia limit





# LWRF Upgrade – The Prequel



## Other Project Motivators





# Livingston WRF Upgrade



## Design Flow Review

### Design Population:

- 7,245 (2016 estimate)  11,500 (2035 estimate)
- ~ 50% increase in sizing/design flow

#### EXISTING

i.	AVERAGE ANNUAL (AA)	0.78	MGD
ii.	MAXIMUM MONTH (MM)	1.49	MGD
iii.	PEAK DAY (PD)	1.75	MGD
iv.	PEAK HOUR (PH)	2.42	MGD
v.	PEAK INSTANTANEOUS (PI)	2.49	MGD

#### 2035 DESIGN

i.	AVERAGE ANNUAL (AA)	1.21	MGD
ii.	MAXIMUM MONTH (MM)	2.18	MGD
iii.	PEAK DAY (PD)	2.57	MGD
iv.	PEAK HOUR (PH)	3.33	MGD
v.	PEAK INSTANTANEOUS (PI)	3.42	MGD



# Livingston WRF Upgrade



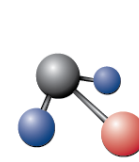
## Design Flow Review

### Peak Design Flows:

- I/I directly correlates to Yellowstone River elevation

Source	Flow (mgd)	BOD (lb/day)	TKN <sup>1</sup> (lb/day)	TSS (lb/day)
<b>2014 PER (2000 to 2012 data)</b>	1.80	3,450	455	4,260
<b>2016 PDR (2013 to 2015 data)</b>	2.18	3,580	535	4,441
<b>Percent Increase</b>	21%	4%	18%	4%





## Design Flow Review

**With RBC rotors breaking, increasing flows and loads, UV disinfection problems and panel bugs, push to bid the project in the winter of 2017 to enable construction in summer of 2017:**

**1 year funding, permitting and design schedule**



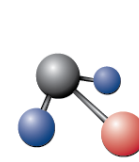
# Livingston WRF Upgrade



## Final Effluent Limits

Table 1. Effluent Limitations: Outfall 001				
Parameter	Units	Effluent Limitations <sup>(1)</sup>		
		Average Monthly Limit	Average Weekly Limit	Daily Maximum Limit
5-Day Biochemical Oxygen Demand	mg/L	30	45	--
	lbs/day	450	751	--
	% removal	85	--	--
Total Suspended Solids	mg/L	30	45	--
	lbs/day	450	751	--
	% removal	85	--	--
pH <sup>(2)</sup>	s.u.	6.0 – 9.0		
<i>Escherichia coli</i> bacteria <sup>(3)(5)</sup>	cfu/100ml	126	252	--
<i>Escherichia coli</i> bacteria <sup>(4)(5)</sup>	cfu/100ml	630	1,260	--
Total Residual Chlorine	µg/L	74 <sup>(6)</sup>	--	136
Total Ammonia, as N <sup>(7)</sup>	mg/L	6.2	--	12.5





## Key Design Decisions

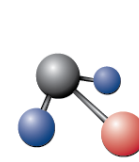
1. Replace Communitor, manual bypass/bar screen and coarse screen with two new coarse screens
2. Upgrade access to Grit Processing Equipment
3. Reuse effluent for grit and other treatment process needs
4. Upgrade Influent Pump Station electrical, HVAC and add a fourth small pump for low flows



## Key Design Decisions

5. Rehab Primary Clarifiers for use as WAS Holding Basins
6. Install two Xylem ICEAS Basins
  - Interlaced Aeration Grids
  - Enable Operations to fight foaming
7. Forego equalization after ICEAS, prior to UV Disinfection

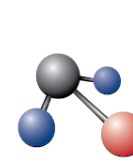




## Key Design Decisions

8. Re-task Chlorine Contact Basin as foundation for new UV Disinfection Facility
9. Convert Anaerobic Digesters to Aerobic Digestion with thickened solids (~ 4%)
10. Rehabilitate existing Control Building for use as Solids Processing Building
11. Procure energy efficiency equipment
12. Utilize Peracetic Acid / UV disinfection in interim to avoid temporary disinfection system





## Reactors and Control Building (RCB)

Two ICEAS basins tied to the Control Building with the following spaces:

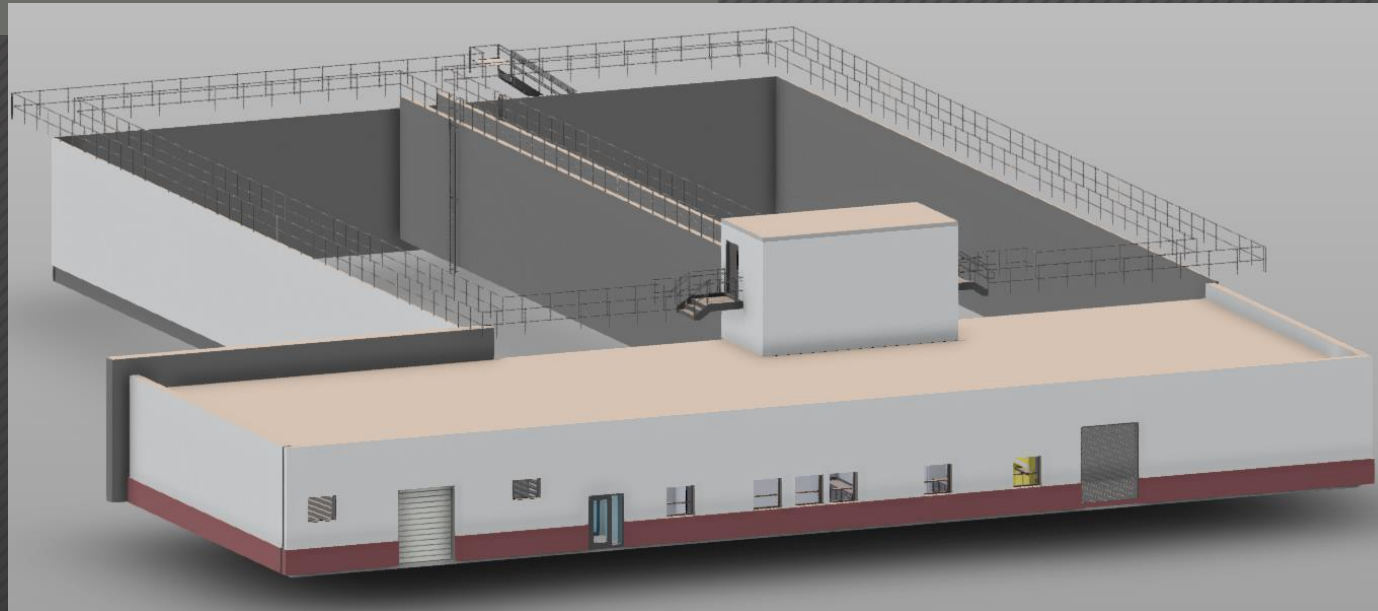
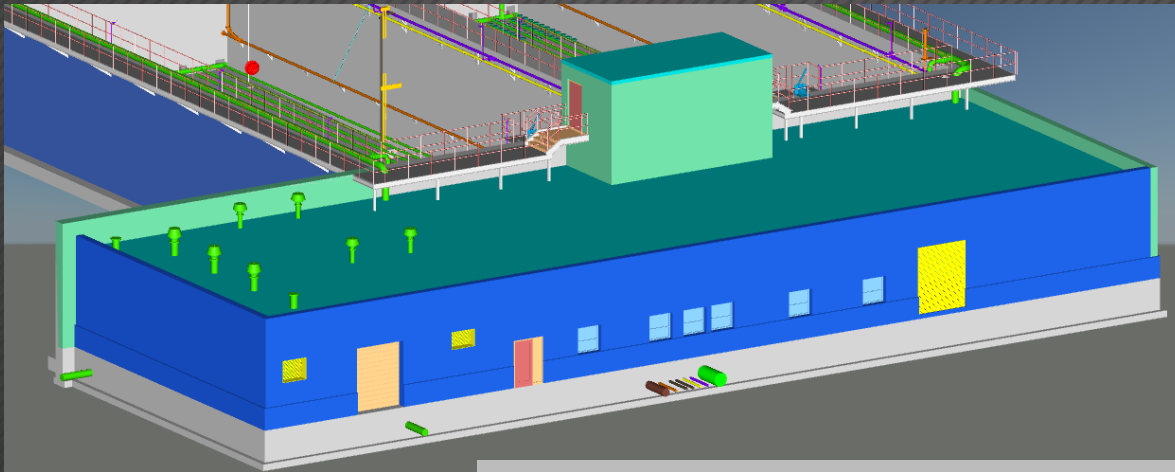
- Blower Room
- Electrical Room
- Standby Generator Room
- Shop Area
- Control Room
- Laboratory
- Mechanical Room
- Office
- Breakroom
- Piping Gallery
- Bathroom/Locker rooms



# Facility Walkthroughs



## Control Building





# Funding Procurement

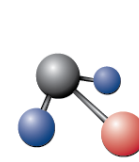


## Joint Effort, Four Agencies:

Funding Procurement: RRGL, TSEP, USDA and SRF

- TSEP: Went from un-ranked in 2014 to 11<sup>th</sup> out of 34 projects in 2016, retained \$625,000 grant even after legislature cut into TSEP funding
- USDA: \$1.7M grant, ~ \$5M Loan at 1.38% interest
- SRF: remainder of project (\$10.6M) plus \$400K loan forgiveness





## Application Process:

- PER serves as primary funding application tool:
  - TSEP application is competitive – go above and beyond
  - USDA-RD
    - Online RD Apply
    - PER plus Environmental Checklist, floodplain documentation
  - Letters to Tribes and other stakeholder agencies
  - Public Meeting – announce 30 days ahead of time



## Challenges

- TSEP: can dictate Award date, long wait between ranking, apparent award, and final authorization
- SRF: requires a Preliminary Engineering Report. In Livingston's case an original PER was amended. SRF has become a little easier to work with on PERs
  - AIS, Davis-Bacon
- USDA brings an additional layer of contract and procurement rules
  - Drove pre-procurement documentation/requirements for SBRs
  - Drove revision of AE2S/City of Livingston Professional Services Agreement
  - Example given: 200-year floodplain design, 500-year floodplain documentation
  - Raises the level of construction oversight and contracting



## Benefits

- Excellent experience and insight provided by funding agency representatives
  - Monthly to bi-monthly funding meetings
  - Facilitated proactive planning, identification and removal of approaching hurdles/roadblocks
- Enabled the City of Livingston to implement a full-scale WRF Upgrade rather than a more surgical, partial-scale improvements project



## Benefits

- Excellent experience and insight provided by funding agency representatives

### Grant Funding Summary:

USDA:	\$1,119,659*
DEQ:	\$ 400,000
RRGL:	\$ 125,000
TSEP:	\$ 625,000
<b>TOTAL:</b>	<b>\$2,269,659</b>

\*Plus \$521,341 of construction contingency,  
should it be necessary



## Lessons Learned

- Present Total Project Costs throughout the project
  - Planning, design, bidding, construction administration
  - Debt service reserve
- Collaborate with the Owner on:
  - Construction cost estimate accuracy with design development
  - Construction / bidding environment
  - Project changes and expectations



## EJCDC

### Engineers Joint Contract Documents Committee

- Provides templates for Engineer-Owner and Construction Contract Documents
- Must be utilized for USDA-RD funded projects
- Familiarity in Montana seems low, despite the fact that these documents serve as the basis of MPWSS

# Cost of Pursuing Funding



## Engineering Agreements

- Originally scoped \$12,120 of “DEQ, Regulatory and Funding Agency Communications” with the understanding that City staff would lead the funding procurement and that it would be RRGL, TSEP and SRF
- Later requested an additional \$56,000 for leading the effort, including pursuit of USDA-RD funding
  - RD-Apply
  - Environmental Checklist
  - EJCDC Contract Documents
  - Public Workshop
  - TSEP Legislature Presentation
  - Monthly meetings
  - Floodplain Mapping
  - PER Amendment



# LWRF Upgrade DEQ Presentation



## Final Funding Breakdown

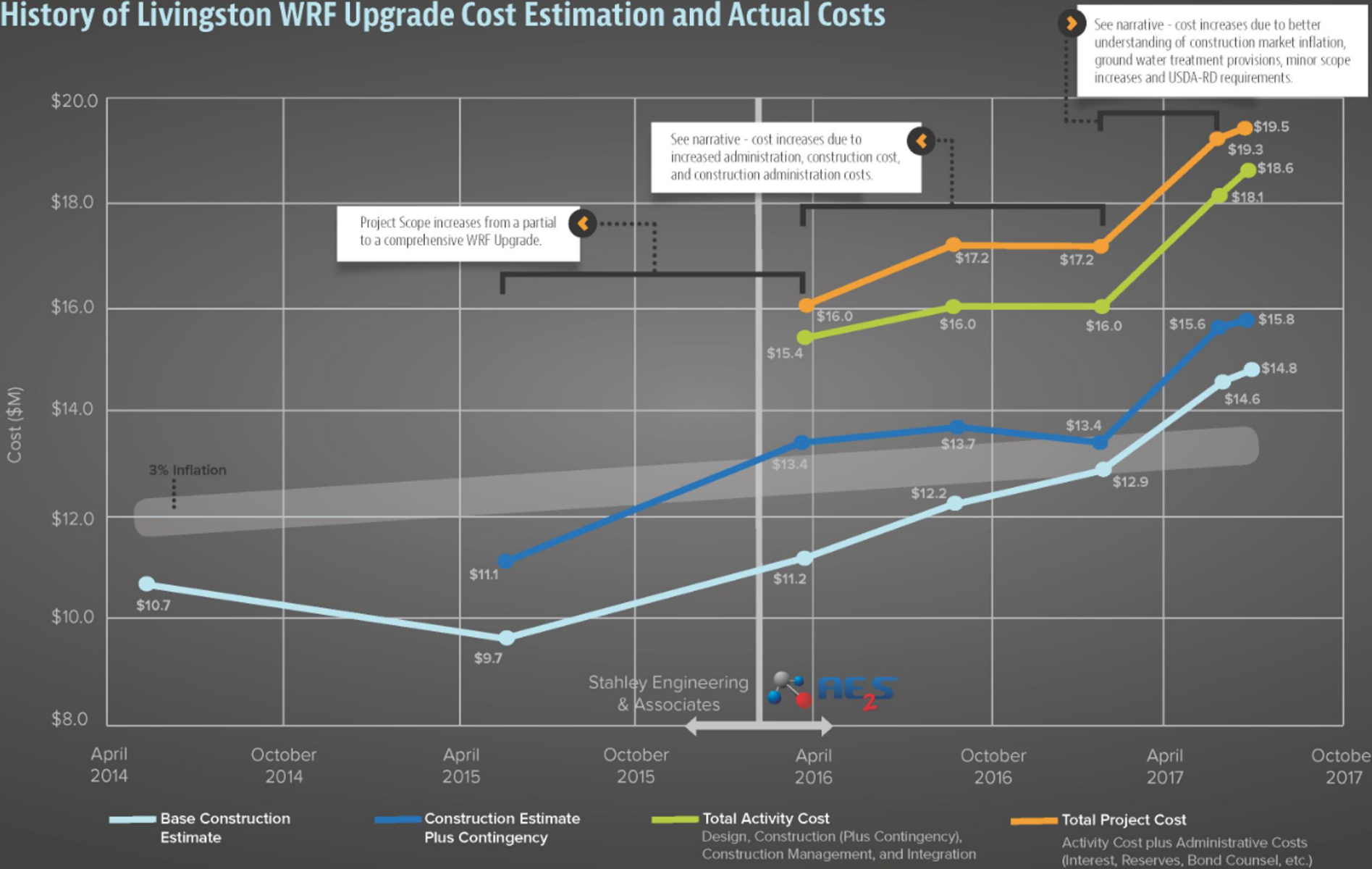
Completed By: DNRC Final		City of Livingston - Final								13-Jul-17
Administrative/ Costs	Finance	RRG Grant \$125,000	City Impact Fees \$300,000	TSEP Grant \$625,000	RD Grant \$1,715,000	RD Loan @ 1.375% \$5,000,000	SRF A Loan \$400,000	SRF B Loan @ 2.5% \$6,500,000 30 Year	SRF C Loan @ 2.5% \$4,840,000 22 Year	Total
Personnel Costs										-
Office Costs										-
Professional Services										-
Legal Costs										-
Audit Fees										-
Travel & Training										-
Interm Interest						75,000				75,000
Loan Reserves				-		162,600		309,938	288,262	760,800
Miscellaneous/Payoff				-		-		-		-
Bond Counsel & Related costs				-		25,000		25,000		50,000
TOTAL ADMIN COSTS:				\$ -		\$ 262,600		\$ 334,938	\$ 288,262	\$ 885,800
ACTIVITY COSTS:										
Engineering Design		50,000			-			1,189,231		1,239,231
I&C/SCADA Programming/Integration				-	208,592			-		208,592
DA Construction		75,000	300,000	625,000	730,320	4,337,400	400,000	4,226,881	4,087,471	14,782,072
Construction engineering				-	254,747	400,000		748,950		1,403,697
Contingency				-	521,341	-			464,267	\$ 985,608
TOTAL ACTIVITY COSTS		\$ 125,000	\$ 300,000	\$ 625,000	\$ 1,715,000	\$ 4,737,400	\$ 400,000	\$ 6,165,062	\$ 4,551,738	\$ 18,619,200
TOTAL COSTS		\$ 125,000	\$ 300,000	\$ 625,000	\$ 1,715,000	\$ 5,000,000	\$ 400,000	\$ 6,500,000	\$ 4,840,000	\$ 19,505,000
						53% RD contingency	47% SRF contingency			

53% RD contingency

47% SRF contingency

- USDA-RD primacy
- Contingency roughly even split between RD Grant and SRF Loan

# History of Livingston WRF Upgrade Cost Estimation and Actual Costs





## Total Project by Funding Source

Total Project Cost = \$19,505,000

**RRGL Grant**  
**\$125,000.00**  
**1%**

SRF C Loan (i=2.5% | 22 yr)  
\$4,840,000.00  
25%

SRF B Loan (i = 2.5% | 30 yr)  
\$6,500,000.00  
33%

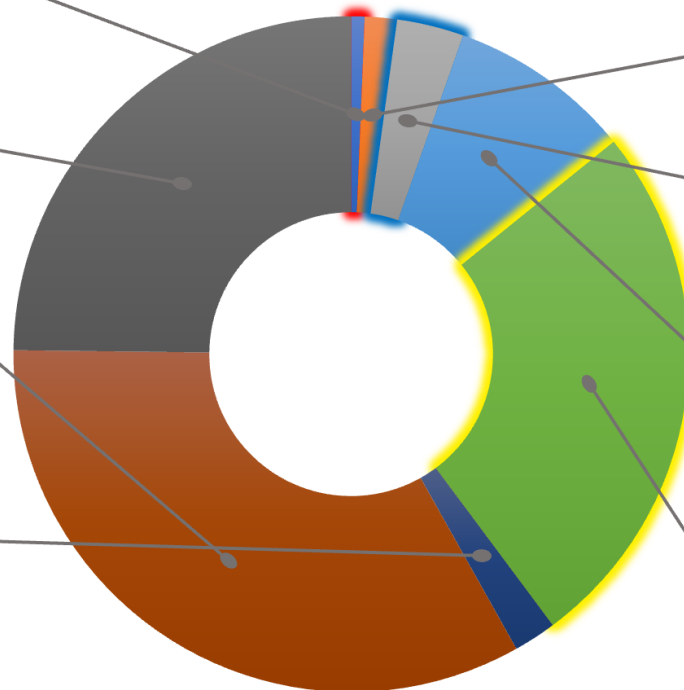
SRF A Loan (To be Foregiven)  
\$400,000.00  
2%

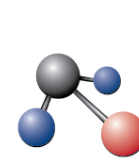
City Impact Fees  
\$300,000.00  
1%

**TSEP Grant**  
**\$625,000.00**  
**3%**

RD Grant  
\$1,715,000.00  
9%

**RD Loan (i = 1.375% | 40 yr)**  
**\$5,000,000.00**  
**26%**





## Lessons Learned

- Present Total Project Costs throughout the project
  - Planning, design, bidding, construction administration
  - Debt service reserve
- Collaborate with the Owner on:
  - Construction cost estimate accuracy with design development
  - Construction / bidding environment
  - Project changes and expectations





Public Works  
Director

Interim City  
Manager



Interim  
City Attorney

Contracted City  
Engineer

Interim Finance  
Director



# Project Challenges



## The Other Constant...



**Dan Emter,  
WRF Superintendent**



# Project Challenges



## Multiple and Varied...

- Compacted Schedule – one year from start to bidding was goal
- Affordability - high wastewater rates in place
- BNSF Contamination Plume / State Superfund status
  - Seasonally high, contaminated groundwater. Contaminated soils.
  - Forced new construction above grade, to avoid dewatering to the maximum extent possible
  - Drove a delay in the bidding and an additional ~\$250,000 in construction administration costs, over \$500,000 in additional construction costs
- SBR Pre-procurement
- Permit issues during design
- Relocated SBRs and Control Building at 60% Design

# Project Challenges



## Rehab, Changes

- Construction of new facilities within operating facility, meet permit, rehab/convert old facilities
- Construction Changes:
  - Premium Efficiency Blower Upgrades
  - UV Building Expansion
  - Dewatering Building HVAC for NFPA Code Compliance
  - Underground Utilities



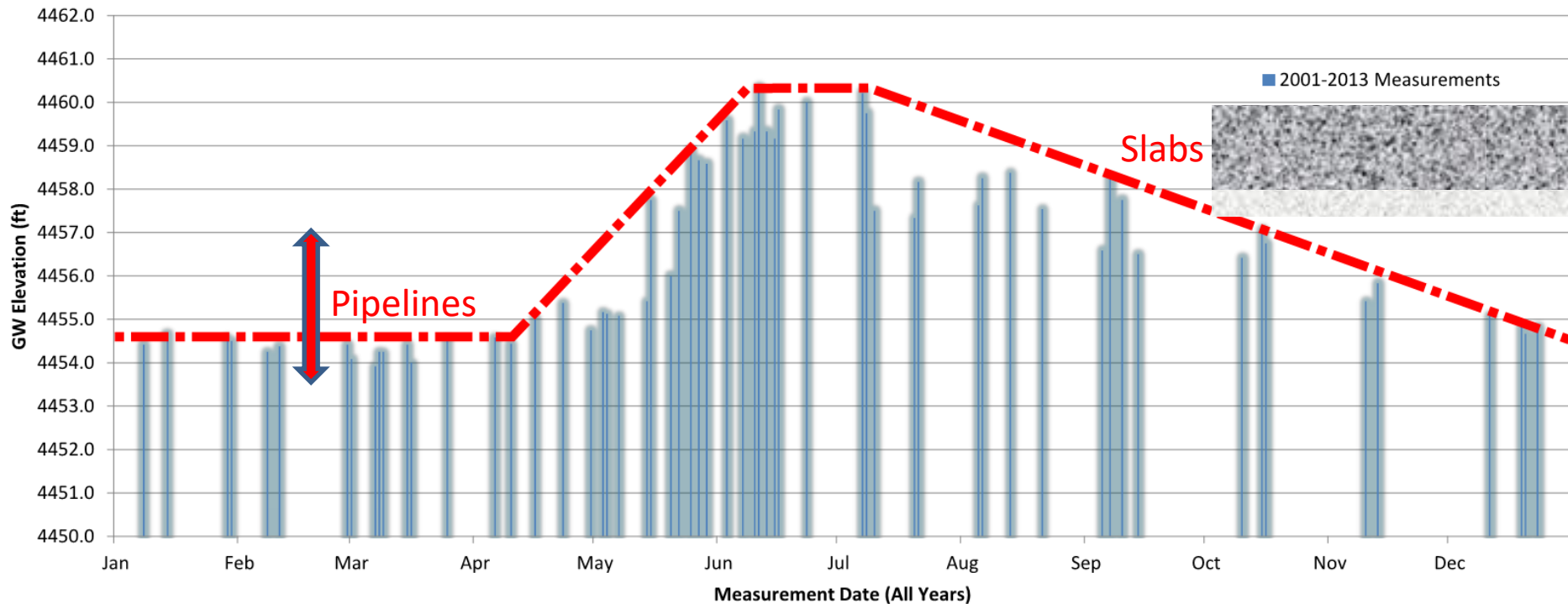
# Groundwater vs. Design

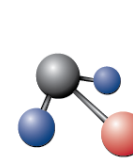


## Groundwater, Slabs, Pipe Connections

Graphics show excavation elevations for Pipelines and Building Slabs:

**LWRF GW Elevations - Measured in On-Site Sprinkler Well 2001-2013**





## EJCDC

### Engineers Joint Contract Documents Committee

- Provides templates for Engineer-Owner and Construction Contract Documents
- Must be utilized for USDA-RD funded projects
- Familiarity in Montana seems low, despite the fact that these documents serve as the basis of MPWSS



# WRF Setting



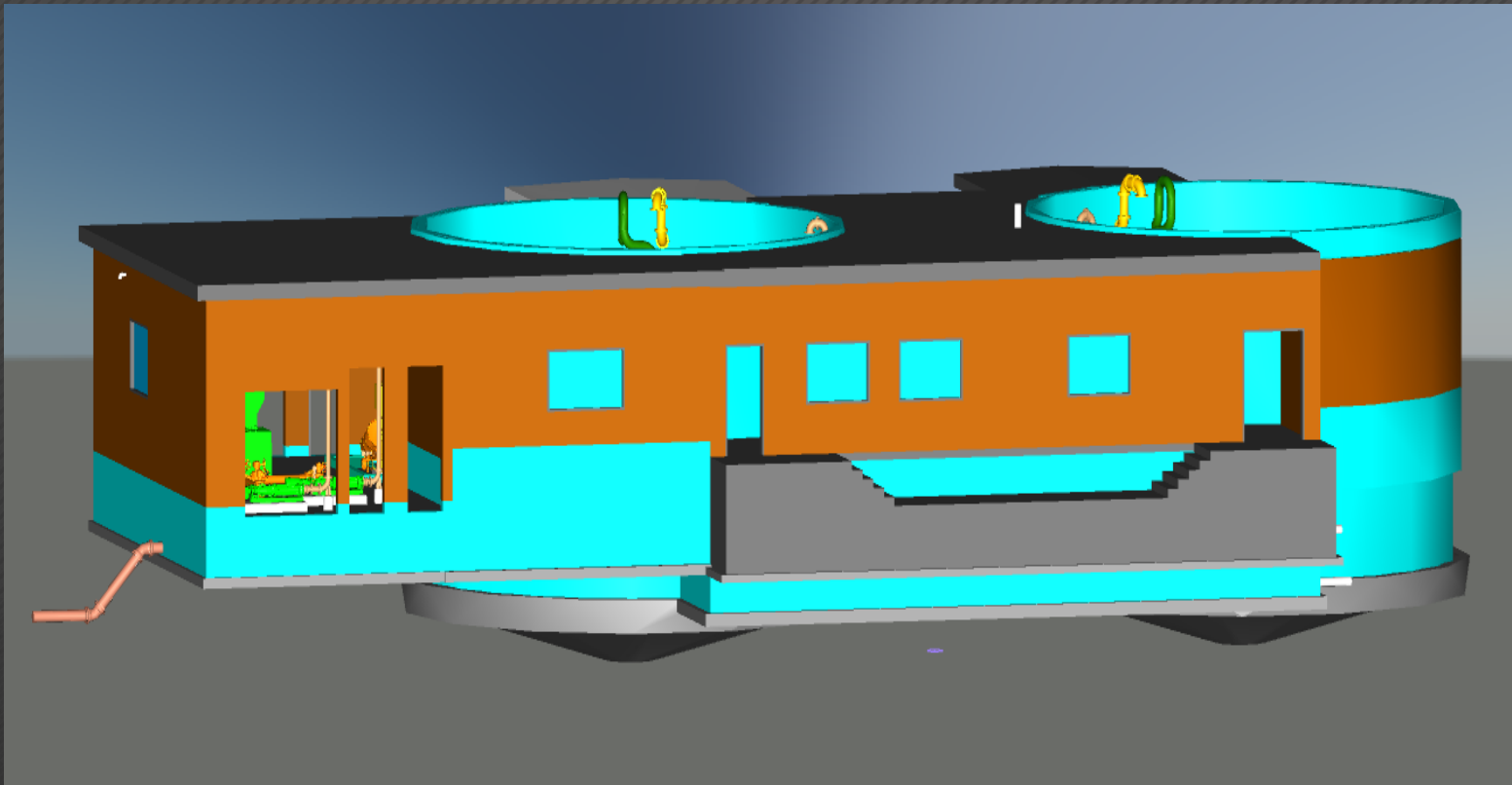
## Pre-Construction



# Project Challenges



## Rehabilitating Existing Facilities

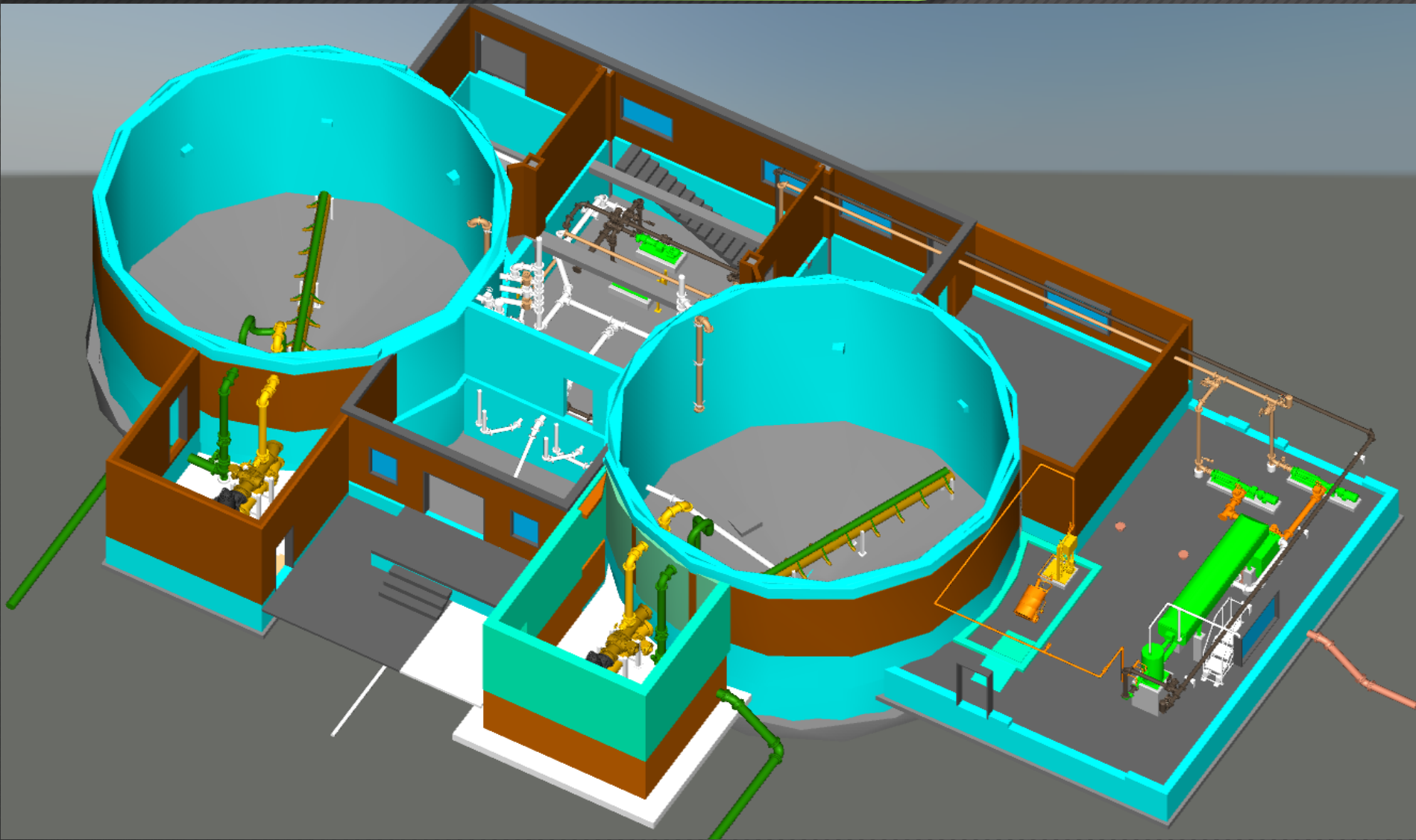




# Existing Facility Rehabilitation



## Control Building to Solids Processing Building



# Existing Facility Rehabilitation



## Control Building to Solids Processing Building





# Existing Facility Rehabilitation



## Thickening Room Slab Surprise





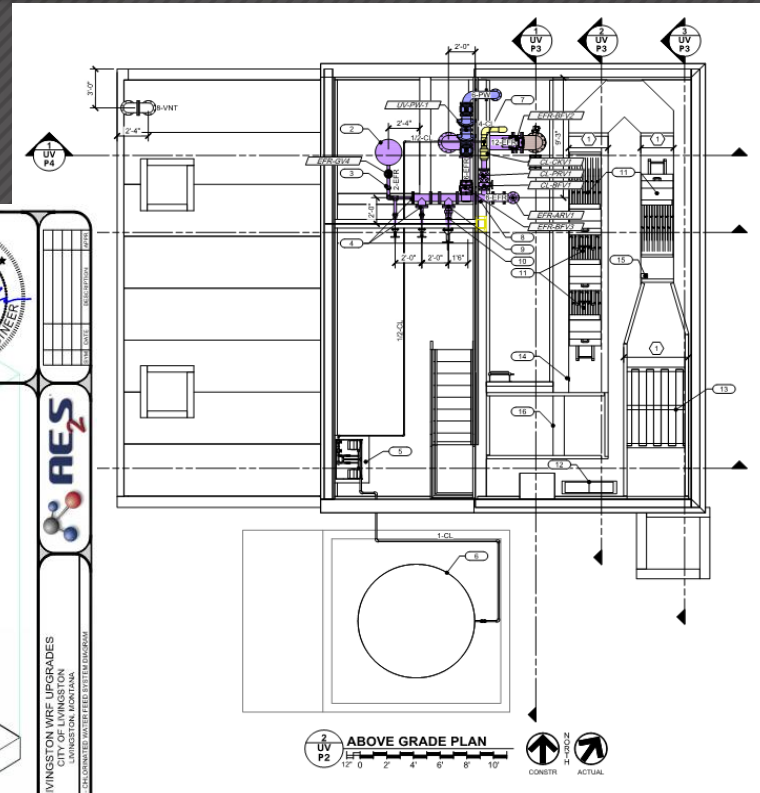






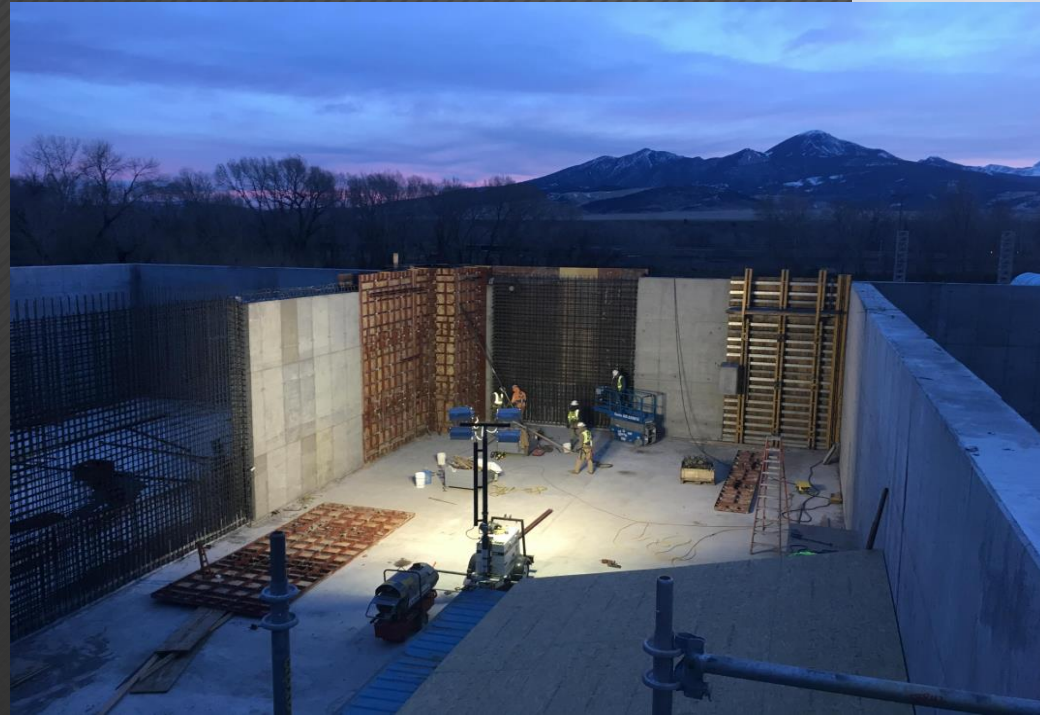


## UV Building over Chlorine Contact





# Construction Photos







Late September...





Late October...



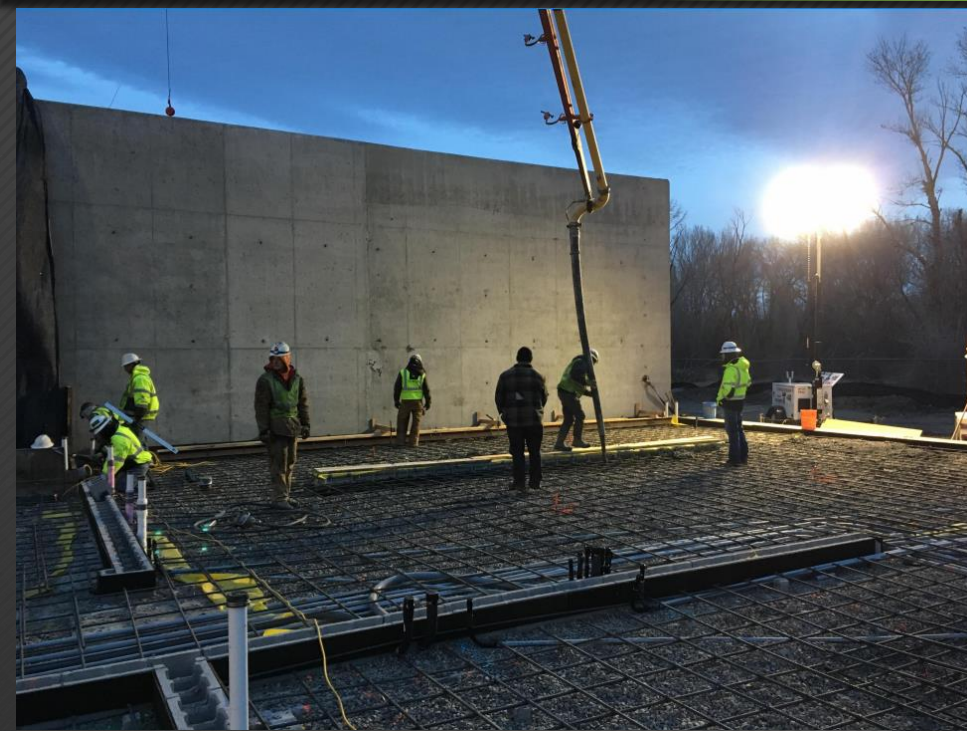




# Construction Update



## From Pre-Dawn to Dusk...











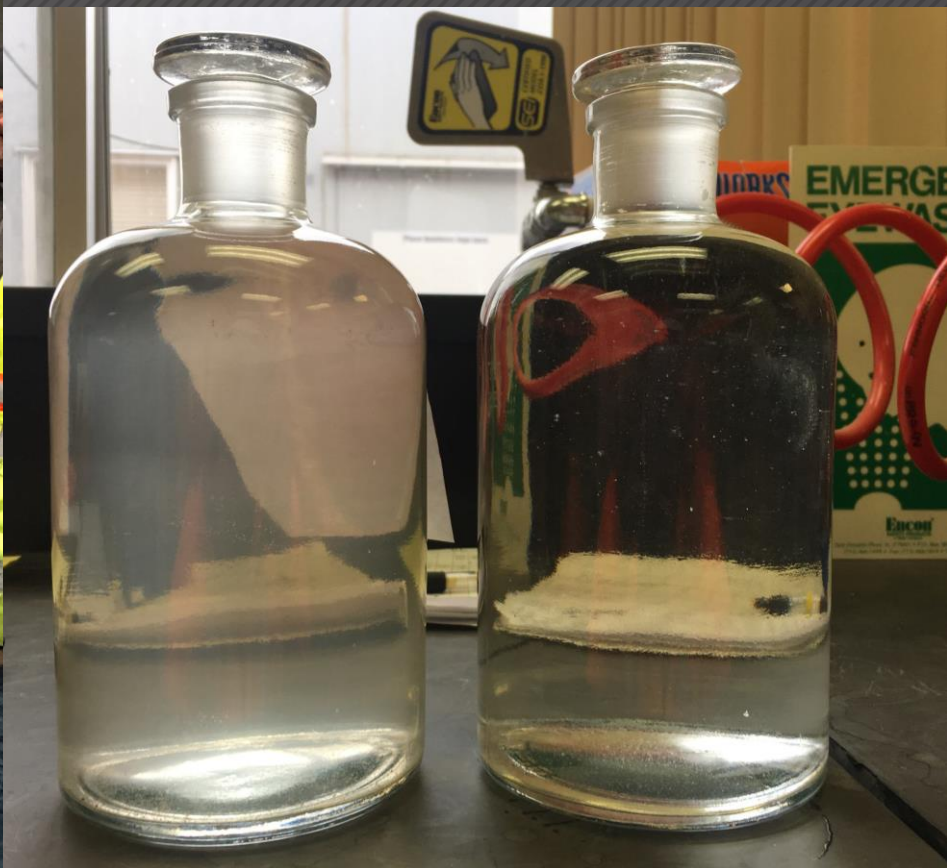






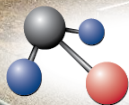








# QUESTIONS?



**AES**  
*2*